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☐ 1. Document ID: US 6466693 B1

Using default format because multiple data bases are involved.

L13: Entry 1 of 10 File: USPT Oct 15, 2002

US-PAT-NO: 6466693
DOCUMENT-IDENTIFIER: US 6466693 B1

TITLE: Image processing apparatus

DATE-ISSUED: October 15, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
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Adachi; Yasushi	Nara			JP
Kanata; Toshihiro	Nara			JP

US-CL-CURRENT: 382/176; 358/466, 382/270

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☑ 2. Document ID: US 6366358 B1

L13: Entry 2 of 10 File: USPT Apr 2, 2002

DOCUMENT-IDENTIFIER: US 6366358 B1
TITLE: Method and apparatus for detecting stripe defects of printed matter

Application Filing Date (1):
19980601

Detailed Description Text (8):
That is, the mask image preparing section 12A has the function of preparing a mask image for excepting, from the subject of the detection-processing, edge portions of lines and patterns, other than streak-like defects included in the image to be detected input by the image inputting section 10. In concrete terms, as the arrangement of the pixels conceptually is shown in, for example, FIG. 15, binary mask image corresponding to only the clear line or the pattern edge, for example, can be prepared by calculating the difference between the pixel values adjacent to each other and then threshold-processing the difference. Suppose that the pixel

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value is described with the same symbol as that of the pixel, the above mask image can be represented by the use of the following equations (1) and (2):

Detailed Description Text (17):
As the result of the calculation using the above equations (1) and (2), there can be prepared the binary image having the density difference of not less than the threshold value T1, that is, comprising only the edges of the clear extracted line or pattern. There is shown in FIG. 17 the above binary image taking the case of FIG. 16 schematically showing an image to be inspected comprising a pattern P and a streak-like defect (doctor streak) D. That is, there can be obtained the binary-coded image in which the edge of only the pattern P having a clear shade is extracted, whereas the edge of the line-like (streak-like) portion, which is low in contrast, such as the doctor streak or the like is not extracted. Then, according to the edge of the image shown in FIG. 17, the mask image comprising a mask portion M having a width enough to mask the edge can be prepared, as shown in FIG. 18.

Current US Original Classification (1):
358/1.14

Current US Cross Reference Classification (1):
358/1.9

☑ 3. Document ID: US 6317223 B1

L13: Entry 3 of 10 File: USPT Nov 13, 2001

DOCUMENT-IDENTIFIER: US 6317223 B1
TITLE: Image processing system for reducing vertically disposed patterns on images produced by scanning

Abstract Text (1):
A digital image processing system applies an edge-based adaptive thresholding technique with different contrast parameters to convert an image into first and second binary images. In the digital processing system of the invention, the first and second binary images are compared and a map of the difference between the first and second binary images is generated. A vertical profile of this map is projected and local peaks in the vertical profile which correspond to a vertical pattern or artifact in the map is detected. Pixels in the first binary image are reversed based on the vertical pattern or artifact in the map. This system is effective in reducing vertical artifacts produced by scanners.

Application Filing Date (1):
19981214

Brief Summary Text (8):
The present invention provides for a digital image processing method which includes the steps of (1) applying an edge-based adaptive thresholding method twice with different contrast parameter settings to convert an image such as a gray scale image into two binary images; (2) generating a map of the difference from the two binary images; (3) projecting the vertical profile of the map; (4) detecting the local peaks, (i.e. vertical lines, dashes, dots, etc.) from the vertical projection profile; (5) locating the regions of the vertical lines, dashes, dots, etc. in the map based on the detected local peaks; and (6) reversing pixels from the binary

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images based on the vertical lines, dashes, dots, etc. of the map.

Brief Summary Text (9):
The method of the present invention includes: capturing a document image by a CCD array in raster scan fashion; applying an edge-based adaptive thresholding technique [1] with a normal contrast setting to extract every detail of image information and storing the resulting binary image, named as B1; applying the same edge-based adaptive thresholding technique with a low contrast setting which only extracts high contrast details of the image, named as B2; labelling the difference of B1 and B2, and storing the map of the difference, named as D; projecting the vertical profile of the map (D); locating the vertically disposed patterns by detecting the local peaks in the vertical projection profile, resulting in a map of the vertically disposed patterns, named as V; reading the binary image (B1) and the map of the vertically disposed patterns (V); and reversing pixels in the B1 image at the corresponding black pixel locations in the V map.

Detailed Description Text (2):
Referring now to the drawings, wherein like reference numerals represent identical or corresponding parts throughout the figures, a block diagram of an image processing method that performs an image thresholding with minimal vertical line artifacts is shown in FIG. 1A. The method and assembly of the present invention will be described with respect to vertical lines, however, it is recognized that the present invention is not limited to the removal of lines. The present invention is applicable to removing or reducing vertically disposed visual patterns or artifacts such as lines, dashes, dots, marks and any combination thereof. In the image processing method of the present invention, an image such as digital gray scale image data (G) is received as input (step 7), and the method operates as follows: (1) An edge-based image thresholding is first applied (step 9) to convert the grey scale image (G) into a binary image (B1) with normal contrast parameter setting which extracts full details of image information; (2) The edge-based image thresholding is applied again (step 11) to convert the grey scale image (G) into another binary image (B2) with low contrast parameter setting which only extracts dark high-contrast objects; (3) The two binary images, (B1) and (B2), are compared pixel-by-pixel (step 15), identifying a pixel as a "black" pixel if there is a difference and a "white" pixel if there is no difference, to generate a map of the difference, named as (D), between the two binary images (B1) and (B2); (4) The vertical visual artifacts such as vertical lines in the map (D) are located (step 17) by doing a vertical projection profile analysis which results in a map of vertical lines, named (V); and (5) The final thresholded image (B) is obtained (step 19) by removing corresponding black pixels and by filling in corresponding white pixels in the thresholded image B1 in the location of the black pixels in the bitmap (V).

Current US Cross Reference Classification (1):
358/463

☐ 4. Document ID: US 5778105 A

L13: Entry 4 of 10 File: USPT Jul 7, 1998

DOCUMENT-IDENTIFIER: US 5778105 A
TITLE: Method of and apparatus for removing artifacts from a reproduction

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Application Filing Date (1):
19960207

Detailed Description Text (85):
While specific values have been given to several of the variables used in the programming illustrated in the FIGS., it should be noted that other values may be substituted therefor. In addition, some or all of the programming can be modified to undertake a different methodology for detecting and/or smoothing edges in the reproduction, if desired. Also, the thresholding for non-edge pixels may be replaced by a different methodology for determining binary values for these pixels, if desired. For example, pixels in the neighborhood of each non-edge pixel could be analyzed as part of an algorithm to obtain binary values for such non-edge pixels.

Current US Cross Reference Classification (1):
358/3.26

☐ 5. Document ID: US 5610999 A

L13: Entry 5 of 10 File: USPT Mar 11, 1997

DOCUMENT-IDENTIFIER: US 5610999 A
**** See image for Certificate of Correction ****
TITLE: Image processing apparatus and method that adds correction signal to average density and digitizes accordingly

Application Filing Date (1):
19940628

Detailed Description Text (11):
The error distribution control circuit 16 calculates the difference between the signal 120 before the binarization and the signal 350 from the threshold value setting circuit 2, representing the average density of the binary data around the object pixel, as the error, and determines errors 160-190 to be distributed to the surrounding pixels, according to the sign of said error and the signal 400 from the edge detection circuit.

Detailed Description Text (47):
Also the edge detection circuit may be so constructed that the signal 400 assumes the level "1" when the absolute value of the difference between the object pixel density and the binary average density is larger than the edge threshold value. This is achieved, in the circuit shown in FIG. 8, by providing an absolute value circuit between the subtracter 32 and the comparator 31, employing an edge threshold value signal [T=40], and causing the comparator 31 to release a signal "1" when the output of said absolute value circuit is larger than the edge threshold value or a signal "0" otherwise.

Current US Cross Reference Classification (1):
358/3.19

Current US Cross Reference Classification (2):
358/3.26

Current US Cross Reference Classification (3):

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358/466

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 6. Document ID: US 5548415 A

L13: Entry 6 of 10 File: USPT Aug 20, 1996

DOCUMENT-IDENTIFIER: US 5548415 A
TITLE: Image processing apparatus

Application Filing Date (1):
19950602

Detailed Description Text (33):
Although two additional density conversion curves which interpolate the density conversion curve for binary images and the density conversion curve for gradation images are used in the present embodiment, the number of the additional density conversion curves can be reduced from two to one. Also, the number of classes into which the sharpness of an edge is classified may be increased by adding comparators having different thresholds to the edge detection circuit 27, thereby providing three or more density conversion curves which interpolate the density conversion curve for binary images and the density conversion curve for gradation images.

Detailed Description Text (105):
Although two additional density conversion curves which interpolate the density conversion curve for binary images and the density conversion curve for gradation images are used in the present embodiment, the number of the additional density conversion curves can be reduced from two to one. Also, the number of classes into which the sharpness of an edge is classified may be increased by adding comparators having different thresholds to the edge detection circuit 7, or the number of classes into which the distances are classified by the distance classifying circuit 11 may be increased, so as to provide three or more density conversion curves which interpolate the density conversion curve fo binary images and the density r conversion curve for gradation images.

Current US Original Classification (1):
358/462

Current US Cross Reference Classification (1):
358/447

Current US Cross Reference Classification (2):
358/448

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 7. Document ID: US 5535013 A

L13: Entry 7 of 10 File: USPT Jul 9, 1996

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DOCUMENT-IDENTIFIER: US 5535013 A
TITLE: Image data compression and expansion apparatus, and image area discrimination processing apparatus therefor

Application Filing Date (1):
19940921

Brief Summary Text (18):
The synthesis signal d is input to the edge signal generator 608, which computes the difference between the maximum and minimum values in the 3.times.3 pixel window of which the center is the target pixel, and outputs an edge signal e. The comparator 609 compares the edge signal e with a predetermined threshold value; if the edge signal e is greater than the threshold value, the comparator 609 outputs a "1" indicating a binary image area, and if less than the threshold value outputs a "0" indicating a halftone image area, to the selector circuit 604. The hue discrimination circuit 605 identifies the hue of the target pixel as one of seven hues, i.e., yellow, magenta, cyan, black, red, green, or blue, and outputs the color hue signals r1, g1, and b1. The threshold value storage ROM 606 outputs to the comparator 609 the identified 8-bit threshold value corresponding to the hue for area discrimination by reading the value at the address defined by the color hue signals r1, g1, and b1.

Current US Cross Reference Classification (1):
358/462

☐ 8. Document ID: US 5442459 A

L13: Entry 8 of 10 File: USPT Aug 15, 1995

DOCUMENT-IDENTIFIER: US 5442459 A
TITLE: Process for encoding a half tone image considering similarity between blocks

Application Filing Date (1):
19931209

Current US Original Classification (1):
358/426.02

CLAIMS:

11. A method of encoding image data, said image data being a binary representation, in pixels, of a document made up of a plurality of lines, in an image transmission system having a signal processor having a memory, a previous buffer memory for storing a previous block of data, a current buffer memory for storing a current block of data and a buffer for storing display data comprising a threshold value of a reference brightness difference value, reference similarity value, average brightness value for said previous block of data, average brightness value for said current block of data, an edge flag having a set or a reset state, and a count value indicating the number of similar pixels etween a current block and a previous block, comprising:

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storing said image data in said memory;

setting an initial value of said average brightness value for said previous block;

placing said edge flag in said reset state;

binarizing said image data to produce binarized image data;

storing said binarized image data in said current buffer memory as said current block of data;

detecting, from said binarized image data, a pixel having a maximum brightness value and a pixel having a minimum brightness value;

determining a brightness difference value between said pixel of said binarized image data having said maximum brightness value and said pixel of said binarized image data having said minimum brightness value;

determining an average brightness value of said binarized image data in said current buffer memory;

comparing said brightness difference value with said reference brightness difference value;

generating a count value by comparing corresponding pixels in the current block and previous block and counting the number of similar pixels;

comparing said reference similarity value with said count value indicating the number of similar pixels between blocks to determine whether said previous block and said current block arc similar, when said brightness difference value is greater than said reference brightness difference value;

encoding said current block as a similar block in a first encoding format, when said current block and said previous block are determined to be similar;

encoding said current block as an edge block in a second encoding format and placing said edge flag in said set state, when said brightness difference value is greater than said reference brightness difference value and said previous block and said current block are not similar;

calculating a difference of average brightness value between said current block and said previous block, when said brightness difference is less than said reference brightness difference;

determining whether said edge flag is in said set state, wherein said set state indicates that the previous block was determined to be an edge block;

encoding said current block as a block following an edge block in a fourth encoding format, when it is determined that said edge flag is in said set state;

determining whether there is a similarity between said current block and said previous block, when it is determined that said edge flag is not in said set state;

encoding said current block as a similar block in said first encoding format, when said brightness difference value is less than said reference brightness difference value, said edge flag is not in said set state and there is similarity between said current block and said previous block;

encoding said current block as a flat block in a third encoding format, when it is

determined that said edge flag is not in said set state and there is no similarity between said current block and said previous block;

placing said edge flag in said reset state;

determining whether all of said image data stored in said memory has been encoded;

determining whether all said lines of said document have been scanned, when it has been determined that all of said image data stored in said memory has been encoded;

scanning a next line of said document and storing said next line as image data in said memory returning to said step of setting an initial value, when it is determined that all said lines of said document have not been scanned.

☑ 9. Document ID: US 5216753 A

L13: Entry 9 of 10 File: USPT Jun 1, 1993

DOCUMENT-IDENTIFIER: US 5216753 A
TITLE: Halftone compression with sharpness preservation

Application Filing Date (1):
19900329

Current US Original Classification (1):
358/1.9

CLAIMS:

6. Data processing apparatus for processing image data which is to printed by a four-bit gray-level print engine, said apparatus comprising:

means for converting the image data into halftone input cells having eight pixels per cell with a resolution of 141 cells per inch at a 45.degree. angle;

means for determining the sharpness distribution of the input cell by analyzing the pixel density gradient across the input cell and at least one adjacent halftone input cell;

means for representing the total of 121 gray levels of the entire input cell at a seven-bit level and for representing the sharpness distribution at a two-bit or three-bit level;

a memory system for storing gray-level and sharpness bits at their respective bit levels which sharpness bits determine which of at least four distribution patterns of threshold and gray-level values are to be used in determining the density of pixels in the cell;

means for retrieving the stored bits from the memory system; and

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means for processing a single value represented by the gray-level bits with a matrix of threshold levels and gray-level values for each pixel in an eight-pixel output cell capable of printing 16 levels of gray in each pixel;

said processing causing the densest level to be used for a pixel if the single value meets the threshold level for that pixel, regardless of the density level used in other pixels of the cell, and, if the single value does not meet the threshold level, causing the level to be dependent upon the single value and the levels used for previous pixels in the cell with each distribution pattern causing the densest pixel to be located substantially along different edges of the halftone output cell;

said output cell having an overall gray-level corresponding to said single value, and the distribution of the gray-level values in said matrix being dependent upon the sharpness distribution bits.

☑ 10. Document ID: US 4722008 A

L13: Entry 10 of 10 File: USPT Jan 26, 1988

DOCUMENT-IDENTIFIER: US 4722008 A
TITLE: Halftone picture processing apparatus

Application Filing Date (1):
19860108

Detailed Description Text (40):
A halftone picture processing apparatus according to a fourth embodiment of the present invention will be described hereinafter. As shown in FIG. 15, the apparatus comprises: a halftone region discrimination section A for discriminating whether or not a block is a halftone region in accordance with changes in succeeding pixel signals along intrablock horizontal scanning and vertical scanning paths; a discrimination correction section B for discriminating that the block is not a halftone region irrespective of the discrimination of the halftone region discrimination section A when the difference between maximum and minimum signal levels of the intrablock pixel signals is smaller than a predetermined threshold value; an edge processing section C for detecting the block is an edge portion of the image and processing the block; and a signal level substitution section 46. The halftone region discrimination section A is substantially the same as that described with reference to the second embodiment (FIG. 7), and the same reference numerals in FIG. 15 denote parts of the same functions as in FIG. 7. The discrimination correction section B is substantially the same as that described in the third embodiment in FIG. 14, and the same reference numerals in FIG. 15 denote the same parts as in FIG. 14.

Current US Cross Reference Classification (1):
358/464

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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Term	Documents
358/$	0
"358/FOR.159"	357
"358/FOR.160"	157
"358/FOR.161"	19
"358/FOR.162"	28
"358/FOR.163"	38
"358/FOR.164"	34
"358/FOR.165"	14
"358/FOR.166"	11
"358/FOR.167"	31
"358/FOR.168"	62
(L1 AND (358/$.CCLS.) AND ((BINAR$3 OR HALFTON$3) WITH DIFFER$5 WITH THRESHOLD$3 WITH EDG$3)).PGPB,USPT,EPAB,JPAB,DWPI,TDBD.	10

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☐ 1. Document ID: US 6466693 B1

Using default format because multiple data bases are involved.

L13: Entry 1 of 10 File: USPT Oct 15, 2002

US-PAT-NO: 6466693
DOCUMENT-IDENTIFIER: US 6466693 B1

TITLE: Image processing apparatus

DATE-ISSUED: October 15, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Otsu; Makoto	Vancouver	WA		
Adachi; Yasushi	Nara			JP
Kanata; Toshihiro	Nara			JP

US-CL-CURRENT: 382/176; 358/466, 382/270

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWMC | Draw De

☑ 2. Document ID: US 6366358 B1

L13: Entry 2 of 10 File: USPT Apr 2, 2002

DOCUMENT-IDENTIFIER US 6366358 B1
TITLE: Method and apparatus for detecting stripe defects of printed matter

Application Filing Date (1):
19980601

Detailed Description Text (8):
That is, the mask image preparing section 12A has the function of preparing a mask image for excepting, from the subject of the detection-processing, edge portions of lines and patterns, other than streak-like defects included in the image to be detected input by the image inputting section 10. In concrete terms, as the arrangement of the pixels conceptually is shown in, for example, FIG. 15, binary mask image corresponding to only the clear line or the pattern edge, for example, can be prepared by calculating the difference between the pixel values adjacent to each other and then threshold-processing the difference. Suppose that the pixel

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value is described with the same symbol as that of the pixel, the above mask image can be represented by the use of the following equations (1) and (2):

Detailed Description Text (17):
As the result of the calculation using the above equations (1) and (2), there can be prepared the binary image having the density difference of not less than the threshold value T1, that is, comprising only the edges of the clear extracted line or pattern. There is shown in FIG. 17 the above binary image taking the case of FIG. 16 schematically showing an image to be inspected comprising a pattern P and a streak-like defect (doctor streak) D. That is, there can be obtained the binary-coded image in which the edge of only the pattern P having a clear shade is extracted, whereas the edge of the line-like (streak-like) portion, which is low in contrast, such as the doctor streak or the like is not extracted. Then, according to the edge of the image shown in FIG. 17, the mask image comprising a mask portion M having a width enough to mask the edge can be prepared, as shown in FIG. 18.

Current US Original Classification (1):
358/1.14

Current US Cross Reference Classification (1):
358/1.9

☑ 3. Document ID: US 6317223 B1

L13: Entry 3 of 10 File: USPT Nov 13, 2001

DOCUMENT-IDENTIFIER: US 6317223 B1
TITLE: Image processing system for reducing vertically disposed patterns on images produced by scanning

Abstract Text (1):
A digital image processing system applies an edge-based adaptive thresholding tech ique with different contrast parameters to convert an image into first and second binary images. In the digital processing system of the invention, the first and second binary images are compared and a map of the difference between the first and second binary images is generated. A vertical profile of this map is projected and local peaks in the vertical profile which correspond to a vertical pattern or artifact in the map is detected. Pixels in the first binary image are reversed based on the vertical pattern or artifact in the map. This system is effective in reducing vertical artifacts produced by scanners.

Application Filing Date (1):
19981214

Brief Summary Text (8):
The present invention provides for a digital image processing method which includes the steps of (1) applying an dge-based adaptive thresholding method twice with different contrast parameter settings to convert an image such as a gray scale image into two binary images; (2) generating a map of the difference from the two binary images; (3) projecting the vertical profile of the map; (4) detecting the local peaks, (i.e. vertical lines, dashes, dots, etc.) from the vertical projection profile; (5) locating the regions of the vertical lines, dashes, dots, etc. in the map based on the detected local peaks; and (6) reversing pixels from the binary

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images based on the vertical lines, dashes, dots, etc. of the map.

Brief Summary Text (9):
The method of the present invention includes: capturing a document image by a CCD array in raster scan fashion; applying an edge-based adaptive thresholding technique [1] with a normal contrast setting to extract every detail of image information and storing the resulting binary image, named as B1; applying the same edge-based adaptive thresholding technique with a low contrast setting which only extracts high contrast details of the image, named as B2; labelling the difference of B1 and B2, and storing the map of the difference, named as D; projecting the vertical profile of the map (D); locating th vertically disposed patterns by e detecting the local peaks in the vertical projection profile, resulting in a map of the vertically disposed patterns, named as V; reading the binary image (B1) and the map of the vertically disposed patterns (V); and reversing pixels in the B1 image at the corresponding black pixel locations in the V map.

Detailed Description Text (2):
Referring now to the drawings, wherein like reference numerals represent identical or corresponding parts throughout the figures, a block diagram of an image processing method that performs an image thresholding with minimal vertical line artifacts is shown in FIG. 1A. The method and assembly of the present invention will be described with respect to vertical lines, however, it is recognized that the present invention is not limited to the removal of lines. The present invention is applicable to removing or reducing vertically disposed visual patterns or artifacts such as lines, dashes, dots, marks and any combination thereof. In the image processing method of the present invention, an image such as digital gray scale image data (G) is received as input (step 7), and the method operates as follows: (1) An edge-based image thresholding is first applied (step 9) to convert the grey scale image (G) into a binary image (B1) with normal contrast parameter setting which extracts full details of image information; (2) The edge-based image thresholding is applied again (step 11) to convert the grey scale image (G) into another binary image (B2) with low contrast parameter setting which only extracts dark high-contrast objects; (3) The two binary images, (B1) and (B2), are compared pixel-by-pixel (step 15), identifying a pixel as a "black" pixel if there is a difference and a "white" pixel if there is no difference, to generate a map of the difference, named as (D), between the two binary images (B1) and (B2); (4) The vertical visual artifacts such as vertical lines in the map (D) are located (step 17) by doing a vertical projection profile analysis which results in a map of vertical lines, named (V); and (5) The final thresholded image (B) is obtained (step 19) by removing corresponding black pixels and by filling in corresponding white pixels in the thresholded image B1 in the location of the black pixels in the bitmap (V).

Current US Cross Reference Classification (1):
358/463

☐ 4. Document ID: US 5778105 A

L13: Entry 4 of 10 File: USPT Jul 7, 1998

DOCUMENT-IDENTIFIER: US 5778105 A
TITLE: Method of and apparatus for removing artifacts from a reproduction

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Application Filing Date (1):
19960207

Detailed Description Text (85):
While specific values have been given to several of the variables used in the programming illustrated in the FIGS., it should be noted that other values may be substituted therefor. In addition, some or all of the programming can be modified to undertake a different methodology for detecting and/or smoothing edges in the reproduction, if desired. Also, the thresholding for non-edge pixels may be replaced by a different methodology for determining binary values for these pixels, if desired. For example, pixels in the neighborhood of each non-edge pixel could be analyzed as part of an algorithm to obtain binary values for such non-edge pixels.

Current US Cross Reference Classification (1):
358/3.26

☐ 5. Document ID: US 5610999 A

L13: Entry 5 of 10 File: USPT Mar 11, 1997

DOCUMENT-IDENTIFIER: US 5610999 A
**** See image for Certificate of Correction ****
TITLE: Image processing apparatus and method that adds correction signal to average density and digitizes accordingly

Application Filing Date (1):
19940628

Detailed Description Text (11):
The error distribution control circuit 16 calculates the difference between the signal 120 before the binarization and the signal 350 from the threshold value setting circuit 2, representing the average density of the binary data around the object pixel, as the error, and determines errors 160-190 to be distributed to the surrounding pixels, according to the sign of said error and the signal 400 from the edge detection circuit.

Detailed Description Text (47):
Also the edge detection circuit may be so constructed that the signal 400 assumes the level "1" when the absolute value of the difference between the object pixel density and the binary average density is larger than the edge threshold value. This is achieved, in the circuit shown in FIG. 8, by providing an absolute value circuit between the subtracter 32 and the comparator 31, employing an edge threshold value signal [T=40], and causing the comparator 31 to release a signal "1" when the output of said absolute value circuit is larger than the edge threshold value or a signal "0" otherwise.

Current US Cross Reference Classification (1):
358/3.19

Current US Cross Reference Classification (2):
358/3.26

Current US Cross Reference Classification (3):

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358/466

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 6. Document ID: US 5548415 A

L13: Entry 6 of 10 File: USPT Aug 20, 1996

DOCUMENT-IDENTIFIER: US 5548415 A
TITLE: Image processing apparatus

Application Filing Date (1):
19950602

Detailed Description Text (33):
Although two additional density conversion curves which interpolate the density conversion curve for binary images and the density conversion curve for gradation images are used in the present embodiment, the number of the additional density conversion curves can be reduced from two to one. Also, the number of classes into which the sharpness of an edge is classified may be increased by adding comparators having different thresholds to the edge detection circuit 27, thereby providing three or more density conversion curves which interpolate the density conversion curve for binary images and the density conversion curve for gradation images.

Detailed Description Text (105):
Although two additional density conversion curves which interpolate the density conversion curve for binary images and the density conversion curve for gradation images are used in the present embodiment, the number of the additional density conversion curves can be reduced from two to one. Also, the number of classes into which the sharpness of an edge is classified may be increased by adding comparators having different thresholds to the edge detection circuit 7, or the number of classes into which the distances are classified by the distance classifying circuit 11 may be increased, so as to provide three or more density conversion curves which interpolate the density conversion curve for binary images and the density conversion curve for gradation images.

Current US Original Classification (1):
358/462

Current US Cross Reference Classification (1):
358/447

Current US Cross Reference Classification (2):
358/448

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 7. Document ID: US 5535013 A

L13: Entry 7 of 10 File: USPT Jul 9, 1996

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DOCUMENT-IDENTIFIER: US 5535013 A
TITLE: Image data compression and expansion apparatus, and image area discrimination processing apparatus therefor

Application Filing Date (1):
19940921

Brief Summary Text (18):
The synthesis signal d is input to the edge signal generator 608, which computes the difference between the maximum and minimum values in the 3.times.3 pixel window of which the center is the target pixel, and outputs an edge signal e. The comparator 609 compares the edge signal e with a predetermined threshold value; if the edge signal e is greater than the threshold value, the comparator 609 outputs a "1" indicating a binary image area, and if less than the threshold value outputs a "0" indicating a halftone image area, to the selector circuit 604. The hue discrimination circuit 605 identifies the hue of the target pixel as one of seven hues, i.e., yellow, magenta, cyan, black, red, green, or blue, and outputs the color hue signals r1, g1, and b1. The threshold value storage ROM 606 outputs to the comparator 609 the identified 8-bit threshold value corresponding to the hue for area discrimination by reading the value at the address defined by the color hue signals r1, g1, and b1.

Current US Cross Reference Classification (1):
358/462

☐ 8. Document ID: US 5442459 A

L13: Entry 8 of 10 File: USPT Aug 15, 1995

DOCUMENT-IDENTIFIER: US 5442459 A
TITLE: Process for encoding a half tone image considering similarity between blocks

Application Filing Date (1):
19931209

Current US Original Classification (1):
358/426.02

CLAIMS:

11. A method of encoding image data, said image data being a binary representation, in pixels, of a document made up of a plurality of lines, in an image transmission system having a signal processor having a memory, a previous buffer memory for storing a previous block of data, a current buffer memory for storing a current block of data and a buffer for storing display data comprising a threshold value of a reference brightness difference value, reference similarity value, average brightness value for said previous block of data, average brightness value for said current block of data, an edge flag having a set or a reset state, and a count value indicating the number of similar pixels etween a current block and a previous block, comprising:

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storing said image data in said memory;

setting an initial value of said average brightness value for said previous block;

placing said edge flag in said reset state;

binarizing said image data to produce binarized image data;

storing said binarized image data in said current buffer memory as said current block of data;

detecting, from said binarized image data, a pixel having a maximum brightness value and a pixel having a minimum brightness value;

determining a brightness difference value between said pixel of said binarized image data having said maximum brightness value and said pixel of said binarized image data having said minimum brightness value;

determining an average brightness value of said binarized image data in said current buffer memory;

comparing said brightness difference value with said reference brightness difference value;

generating a count value by comparing corresponding pixels in the current block and previous block and counting the number of similar pixels;

comparing said reference similarity value with said count value indicating the number of similar pixels between blocks to determine whether said previous block and said current block arc similar, when said brightness difference value is greater than said reference brightness difference value;

encoding said current block as a similar block in a first encoding format, when said current block and said previous block are determined to be similar;

encoding said current block as an edge block in a second encoding format and placing said edge flag in said set state, when said brightness difference value is greater than said reference brightness difference value and said previous block and said current block are not similar;

calculating a difference of average brightness value between said current block and said previous block, when said brightness difference is less than said reference brightness difference;

determining whether said edge flag is in said set state, wherein said set state indicates that the previous block was determined to be an edge block;

encoding said current block as a block following an edge block in a fourth encoding format, when it is determined that said edge flag is in said set state;

determining whether there is a similarity between said current block and said previous block, when it is determined that said edge flag is not in said set state;

encoding said current block as a similar block in said first encoding format, when said brightness difference value is less than said reference brightness difference value, said edge flag is not in said set state and there is similarity between said current block and said previous block;

encoding said current block as a flat block in a third encoding format, when it is

determined that said edge flag is not in said set state and there is no similarity between said current block and said previous block;

placing said edge flag in said reset state;

determining whether all of said image data stored in said memory has been encoded;

determining whether all said lines of said document have been scanned, when it has been determined that all of said image data stored in said memory has been encoded;

scanning a next line of said document and storing said next line as image data in said memory returning to said step of setting an initial value, when it is determined that all said lines of said document have not been scanned.

☑ 9. Document ID: US 5216753 A

L13: Entry 9 of 10 File: USPT Jun 1, 1993

DOCUMENT-IDENTIFIER: US 5216753 A
TITLE: Halftone compression with sharpness preservation

Application Filing Date (1):
19900329

Current US Original Classification (1):
358/1.9

CLAIMS:

6. Data processing apparatus for processing image data which is to printed by a four-bit gray-level print engine, said apparatus comprising:

means for converting the image data into halftone input cells having eight pixels per cell with a resolution of 141 cells per inch at a 45.degree. angle;

means for determining the sharpness distribution of the input cell by analyzing the pixel density gradient across the input cell and at least one adjacent halftone input cell;

means for representing the total of 121 gray levels of the entire input cell at a seven-bit level and for representing the sharpness distribution at a two-bit or three-bit level;

a memory system for storing gray-level and sharpness bits at their respective bit levels which sharpness bits determine which of at least four distribution patterns of threshold and gray-level values are to be used in determining the density of pixels in the cell;

means for retrieving the stored bits from the memory system; and

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means for processing a single value represented by the gray-level bits with a matrix of threshold levels and gray-level values for each pixel in an eight-pixel output cell capable of printing 16 levels of gray in each pixel;

said processing causing the densest level to be used for a pixel if the single value meets the threshold level for that pixel, regardless of the density level used in other pixels of the cell, and, if the single value does not meet the threshold level, causing the level to be dependent upon the single value and the levels used for previous pixels in the cell with each distribution pattern causing the densest pixel to be located substantially along different edges of the halftone output cell;

said output cell having an overall gray-level corresponding to said single value, and the distribution of the gray-level values in said matrix being dependent upon the sharpness distribution bits.

☑ 10. Document ID: US 4722008 A

L13: Entry 10 of 10 File: USPT Jan 26, 1988

DOCUMENT-IDENTIFIER: US 4722008 A
TITLE: Halftone picture processing apparatus

Application Filing Date (1):
19860108

Detailed Description Text (40):
A halftone picture processing apparatus according to a fourth embodiment of the present invention will be described hereinafter. As shown in FIG. 15, the apparatus comprises: a halftone region discrimination section A for discriminating whether or not a block is a halftone region in accordance with changes in succeeding pixel signals along intrablock horizontal scanning and vertical scanning paths; a discrimination correction section B for discriminating that the block is not a halftone region irrespective of the discrimination of the halftone region discrimination section A when the difference between maximum and minimum signal levels of the intrablock pixel signals is smaller than a predetermined threshold value; an edge processing section C for detecting the block is an edge portion of the image and processing the block; and a signal level substitution section 46. The halftone region discrimination section A is substantially the same as that described with reference to the second embodiment (FIG. 7), and the same reference numerals in FIG. 15 denote parts of the same functions as in FIG. 7. The discrimination correction section B is substantially the same as that described in the third embodiment in FIG. 14, and the same reference numerals in FIG. 15 denote the same parts as in FIG. 14.

Current US Cross Reference Classification (1):
358/464

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Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Term	Documents
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"358/FOR.161"	19
"358/FOR.162"	28
"358/FOR.163"	38
"358/FOR.164"	34
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"358/FOR.167"	31
"358/FOR.168"	62
(L1 AND (358/$.CCLS.) AND ((BINAR$3 OR HALFTON$3) WITH DIFFER$5 WITH THRESHOLD$3 WITH EDG$3)).PGPB,USPT,EPAB,JPAB,DWPI,TDBD.	10

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